***If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.***
***The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.***
***Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.***

C-A OPERATIONS PROCEDURES MANUAL

# 7.1.60 Regeneration of Cold Turbines "B" Train

Text Pages 2 through 7

Hand Processed Changes

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Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

S. Sakry

## 7.1.60 Regeneration of Cold Turbines "B" Train

### 1. Purpose

To provide instructions for regenerating the cold turbine "B" train on the RHIC 25 kW helium refrigerator. The procedure is used to warm the turbines and remove moisture. The procedure contains the following sections:

5.1 Regeneration of turbines 5B only.
5.2 Regeneration of turbines 6B only.
5.3 Regeneration of turbines 5B, 6B and heat exchanger HX7B.

### 2. Responsibilities

2.1 The Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log and in the Cryogenic Valve Log.

2.2 Should a problem arise in the process of the procedure, the Shift Supervisor shall report to the Technical Supervisor for instructions before continuing.

### 3. Prerequisites

3.1 The Operator shall be trained by the Shift Supervisor.

3.2 Operator shall be familiar with the refrigerator P&ID drawing 3A995009, the physical location of components on the refrigerator, and the refrigerator control pages found on the CRISP control system. Valves and equipment mentioned in this procedure will be found on drawing 3A995009.

3.3 The regeneration skid must be available for use.

### 4. Precautions

4.1 If there is liquid helium in the refrigerator pots, all personnel entering the refrigeration wing of 1005R must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM) and carry an emergency escape pack, if the refrigerator is operating.

## 5. Procedure

5.1 Turbines 5B Only

_____ 5.1.1 Date_____.

_____ 5.1.2 Ensure mechanical brakes are installed per C-A-OPM 7.1.26, "Expander Brake System Installation and Removal."

_____ 5.1.3 Ensure the following valves are closed:

Process:

H785A____
H797M____

Valves to Atmosphere, Relief Heading or Pure Helium:

| | |
|---|---|
| H814M____ | H695M____ |
| H414M____ | H395M____ |
| H431M____ | H700M____ |
| H393M____ | H412M____ |
| H9180M____ | |

_____ 5.1.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.1.5 Ensure that the regulator PR9178M has been replaced with the spool piece.

_____ 5.1.6 Open the following valves:

| | |
|---|---|
| H430M____ | H795M____ |
| H793M____ | H812M____ |
| H9178M____ | H790A____ (Vanes) |

_____ 5.1.7 Close regen manifold bypass valve H9100M.

_____ 5.1.8 Turn on regen skid pre-heater.

_____ 5.1.9 Monitor expander 5B outlet temperature at TT789H.

_____ 5.1.10 When TT789H reaches 290$^{o}$K, continue to regenerate for at least one hour. Hygrometer reading must be –20$^{o}$C to –40$^{o}$C and improving less than 0.5$^{o}$C/hour.

_____ 5.1.11 Turn off regen skid pre-heater.

_____ 5.1.12 Open bypass valve H9100M.

_____ 5.1.13 Close the following valves:

| | |
|---|---|
| H790A____ (Vanes) | H9178M____ |
| H812M____ | H793M____ |
| H795M____ | H430M____ |

_____ 5.1.14 Secure the regen skid per C-A OPM 7.1.36.

_____ 5.1.15 Install regulator PR9178M.

_____ 5.1.16 Purge expander 5B per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

5.2 Turbines 6B Only

_____ 5.2.1 Date_____.

_____ 5.2.2 Ensure mechanical brakes are installed on turbines 6B per C-A OPM 7.1.26, "Expander Brake System Installation and Removal."

_____ 5.2.3 Ensure the following valves are closed:

Process:

H802A____
H809A____
H810M____

Valves to Atmosphere, Relief Valve Header or Pure Helium:

| | |
|---|---|
| H414M____ | H412M____ |
| H431M____ | H795M____ |
| H793M____ | H695M____ |
| H393M____ | H395M____ |
| H9188M____ | |

_____ 5.2.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.2.5 Ensure that regulator PR9186M has been replaced with the spool piece.

_____ 5.2.6 Open the following valves:

| | |
|---|---|
| H430M____ | H700M____ |
| H814M____ | H812M____ |
| H9186M____ | H864A____ (Vanes) |

_____ 5.2.7 Close regen skid bypass valve H9100M.

_____ 5.2.8 Turn on regen skid pre-heater.

_____ 5.2.9 Monitor expander 6B outlet temperature at TT808H.

_____ 5.2.10 When TT808H reaches 290$^{o}$K, continue to regenerate for at least one hour. Hygrometer reading must be –20$^{o}$C to –40$^{o}$C and improving less than 0.5$^{o}$C/hour.

_____ 5.2.11 Turn off regen skid pre-heater.

_____ 5.2.12 Open bypass valve H9100M.

_____ 5.2.13 Close the following valves:

| | |
|---|---|
| H864A____ (Vanes) | H9186M____ |
| H812M____ | H814M____ |
| H700M____ | H430M____ |

_____ 5.2.14 Secure the regen skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.2.15 Install regulator PR9186M.

_____ 5.2.16 Purge expanders 6B per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

5.3 Turbines 5B, 6B and Heat Exchanger HX7B

_____ 5.3.1 Date_____.

_____ 5.3.2 Ensure that mechanical brakes are installed on turbines per C-A OPM 7.1.26, "Expander Brake System Installation and Removal."

_____ 5.3.3 Ensure the following valves are closed:

Process:

| | |
|---|---|
| H785A____ | H809M____ |
| H799M____ | H810M____ |

Valves to Atmosphere, Relief Header or Pure Helium:

| | |
|---|---|
| H814M____ | H795M____ |
| H414M____ | H395M____ |
| H431M____ | H9186M____ |
| H393M____ | H412M____ |
| H9180M____ | H695M____ |

_____ 5.3.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.3.5 Ensure that the regulator PR9178M has been replaced with the spool piece.

_____ 5.3.6 To avoid spinning turbines, ensure HX7B pressure is approximatley equal to expander pressure (within 0.5 atm).

_____ 5.3.7 Open process valves H797M____ and H802A____ (air must be jumpered at valve).

_____ 5.3.8 Open the following valves:

| | |
|---|---|
| H430M____ | H812M____ |
| H793M____ | H790A____ (Vanes) |
| H9178M____ | H864A____ (Vanes) |
| H700M____ | |

_____ 5.3.9 Close regen manifold bypass valve H9100M.

_____ 5.3.10 Turn on regen skid pre-heater.

_____ 5.3.11 Monitor expander 6B outlet temperature at TT808H.

_____ 5.3.12 When TT808H reaches 290$^{o}$K, continue to regenerate for at least one hour. Hygrometer reading must be –20$^{o}$C to –40$^{o}$C and improving less than 0.5$^{o}$C/hour.

_____ 5.3.13 Turn off regen skid pre-heater.

_____ 5.3.14 Open bypass valve H9100M.

_____ 5.3.15 Close the following valves:

| | |
|---|---|
| H864A____ (Vane) | H9187M____ |
| H790A____ (Vane) | H793M____ |
| H812M____ (Vane) | H430M____ |
| H700M____ (Vane) | |

_____ 5.3.16 Install regulator PR9178M.

_____ 5.3.17 Purge expanders 5B, 6B and heat exchanger HX7B per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

_____ 5.3.18 Close the following process valves:

H802A____ (return air lines to normal)
H738M____

_____ 5.3.19 Secure regen skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

## 6. Documentation

6.1 The check-off lines are for place keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

## 7. References

7.1 C-A OPM 7.1.26, "Expander Brake System Installation and Removal"

7.2 C-A OPM 7.1.36, "Regeneration System Normal Operation"

7.3 C-A OPM 7.1.24, "Cold Expander Purge Procedure"

## 8. Attachments

None